

THURSDAY, JULY 1, 1886

KEPLER'S CORRESPONDENCE WITH
HERWART VON HOHENBURG

Ungedruckte wissenschaftliche Correspondenz zwischen Johann Kepler und Herwart von Hohenburg, 1599.
Ergänzung zu: *Kepleri Opera Omnia*, ed. Chr. Frisch.
Nach den MSS. zu München und Pulkowa edirt von
C. Anschütz. (Prag: Victor Dietz, 1886.)

HERWART VON HOHENBURG was a highly stimulating correspondent. His scientific curiosity was insatiable; his official duties as Bavarian Chancellor precluded personal research; and he accordingly deputed to the busy brain of Kepler the working out of problems which engaged his scanty leisure, while baffling his powers. The pressure of his demands was, indeed, so severe that Kepler at times bewailed himself in confidential quarters over the grinding labours they imposed upon him: but he could ill afford to quarrel with a patron who was as generous as he was inquisitive; and he thus continued to evolve for his benefit the stores of curious learning and adventurous theory of which some considerable specimens have lately been unearthed, and are now presented to the public.

The correspondence took its origin from the publication, in 1596, of the "*Mysterium Cosmographicum*," by which Herwart's admiring attention was drawn to the speculative young "mathematicus" of the Styrian States; and continued from October 1597 to December 1609. There was, however, a gap in its records. Three letters, known to have been written by Kepler to Herwart in the year 1599, were not forthcoming. Dr. Frisch, the late indefatigable editor of Kepler's "*Opera Omnia*," gave up the search as hopeless; and the detection of the latitant documents became possible only with the correction, in a new printed catalogue of the manuscript collections in the Munich State Library, of an error in the old printed one,—an example, were such needed, of the uses to historical research of the least inviting bibliothecarian drudgery. The opportunity for discovery was promptly turned to account by M. Carl Anschütz, the editor of the present *brochure*; who deserves the acknowledgments of every one interested in scrutinising the workings of a most singularly and brilliantly constituted mind, not alone for the zeal of his inquiries, but also for the elaborate care with which he has set forth their results, rendering intelligible by copious annotations what must otherwise have remained, to the vast majority of readers, hopelessly obscure.

The truth chiefly emphasised by a perusal of these remarkable letters is that of the inextricable entanglement of Kepler's mystical with his scientific views. Many men have speculated wildly while investigating acutely; Kepler alone, perhaps, investigated acutely *because* he speculated wildly. His visions of abstract beauty and order in a neatly fenced and finished universe warmed his fancy, and inspired and lightened labours which would otherwise have been insupportable. His discoveries were the fruit of his illusions, because his illusions were faithfully and unwearyingly confronted with the realities of nature. He

was a dreamer; but he was not content to leave his dreams undisturbed by facts. Hence his superiority—

ἔξοχος Ἀργείων κεφαλὴν τε καὶ εὐρέας ὤμους—

to the common run of Pythagorean enthusiasts, and hence his great name in scientific history.

The topics discussed in the present correspondence forcibly illustrate the compound nature of his mind, no less visionary in its instincts than positive in its methods. They include the theory of eclipses, the *rationale* of planetary influences, the harmonic relations of planetary velocities, the date of the birth and the horoscope of Augustus, the nature of terrestrial magnetism, and the position, actual and primitive, of the north magnetic pole. The first of the three letters is dated from Gratz, April 9 and 10, 1599. It opens with a pompous eulogium on Tycho Brahe. "Taceant omnes, et Tycho ni Brahe Dani auscultent." Nor does it detract, we are told, from his merits to have taken a wrong theoretical turn. His hostility to the motion of the earth nowise impairs the excellence of his observations and instruments. Each astronomer is free to embrace, without discredit to his skill and erudition, whatever "religion of movement" seems best to himself. "Sed ad rem."

Tycho, deceived no doubt by reports of coronal splendours (he had never himself witnessed the phenomenon), had denied the possibility of a total solar eclipse, the moon suffering, he alleged, a diminution of one-fifth of its apparent diameter when projected on the sun. Kepler, while unconvinced of the fact, was at no loss for an explanation. A dense lunar atmosphere, powerfully reflective of the sun's rays, while partially permeable by them, was invoked by him to augment the seeming dimensions of the full moon, and throw a kind of subdued glory round the eclipsed sun. The perplexity started by Tycho was not, however, so easily allayed. It kept cropping up at intervals; and led eventually both to Kepler's optical researches, and to what we may call his discovery of the corona, as an actual fact to be reckoned with by science. The eclipse observed by Clavius at Rome in 1567 he showed to have been unquestionably total; the sun was fully covered by the moon; yet an unlooked-for radiance survived ("*Op. Omnia*," t. ii. p. 318). He accounted for it by the illumination of an "ethereal substance" in the solar neighbourhood, "not altogether nothing, but possessing some measure of density"; nor have we yet got much beyond the approximate ratification of his conjecture.

Later in life Kepler formally laid down his arms before the lunar theory, after spending enormous labour on the effort to bring it into conformity with his Laws. But here, in these long-missing letters, he unexpectedly emerges as the discoverer of the moon's annual equation. The fact seems to admit of no doubt; his words are explicit. The discrepancies between the observed and calculated times of eclipses compelled the correction. Had not Copernicus, he remarks, been occupied with greater things, he must have introduced the same "annual inequality" depending upon the eccentricity of the earth's orbit. "What he neglected," he adds, "I now do." The chief merit of this important advance has usually been ascribed to Tycho. He had doubtless glimpses of its necessity, but omitted to follow them up. The earliest

explicit declaration hitherto known in favour of introducing such a correction was contained in a letter from Kepler to Bernegger of June 30, 1625 ("Op. Omnia," t. vi. p. 618). It now appears, not only that the conclusion was an entirely original one, but that he had arrived at it twenty-six years previously. M. Anschütz promises some further elucidations of the point, which we await with interest.

One of the most curious chapters in Kepler's mental history is furnished by his attitude towards the astrological superstitions of his time. Herwart, as a good Catholic, had condemned them; his correspondent made out a case in reply. His contention, it is true, was not on behalf of the vulgar charlatanry of the science. This he admitted to be indefensible, save on the one poor plea of stringent necessity. Providence, as he wrote to Maestlin, which had denied to no animal the means of preserving its life, had assigned, for that end, astrology to the astronomer. He must draw horoscopes and publish prophesying calendars, or cease to exist. Thus only could he obtain means to pursue nobler studies. The people, while giving their money for the lies they loved, unconsciously promoted the truth they were indifferent to. It was an involuntary, but none the less efficacious, "endowment of research."

So Kepler filled his empty pockets, and satisfied his conscience by professing incredulity in his own vaticinations. They proved, nevertheless, and, as it were, in his own despite, highly successful. Not a few of them stumbled felicitously into fulfilment. Some art, or luck, drew them, now and again, into conformity with the future. And since, as their author himself remarked, the game is one in which the hits count, but the misses are forgotten ("Das Treffen behält man, das Fehlen aber vergisst man") his reputation as a seer rose high, and brought him in the best and only sure part of his income.

There was, however, a recondite species of planetary influence believed in by Kepler as part of the eternal order of things. By the belief, indeed, his whole career of investigation was profoundly influenced; for the effort to justify it led him into a track of thought which finally conducted him to the Third Law. One of the chief points of interest in the present correspondence is that it discloses the time and manner of his entrance upon that track. "Lift up your ears to listen: Eureka!" he wrote to Maestlin, August 29, 1599; and to Herwart, August 6, he solemnly announced his invention of a "theoremata jucundum," in which was concentrated the whole secret of the music of the spheres. Already he gives the title ("de Harmonia Mundi"), and, to a certain extent, the plan, of the great work published twenty years later. It was conceived, as we now see with additional clearness, less under the influence of sober truth-seeking, than in the fervour of illusive speculation. Essentially, it was a piece of brilliant extravagance. That the harmonic law of periods and distances should have been found as a nugget amid such worthless, though shining debris, is one of the oddest facts in the history of science.

The theory of planetary harmonies was struck out by Kepler as an adjunct to his peculiar theory of planetary aspects. It might in fact be called its dynamical counterpart. Geometrical relations of movement were substituted

in it for geometrical relations of position. The velocities of the six planets were, he averred, so connected that, were there an inter-planetary medium capable of conveying audible vibrations, a celestial chord of the sixth and fourth would perpetually resound through space. The intellectual perception of potential harmonies sufficed, however, for the delectation of the rational creatures appointed to enjoy them; while, similarly, the intellectual apprehension of "aspects" affected, primarily, the sentient "soul of the world," and, secondarily, through the varying moods thus impressed by the stars, the course of sublunary affairs. The third letter to Herwart is mainly filled with details of Kepler's persevering efforts to complete and fortify the visionary analogy between astrological aspects and musical intervals.

Yet even here, in this region of intangible speculation, his innate respect for facts did not desert him. What autobiographical details he left, we owe to his desire to compare his life as it was with what, astrologically, it ought to have been. And the first of the present letters contains a highly curious little bit of self-study, illustrative of the depressing effects of "Saturn in sextile with the Sun" at the hour of nativity. Here is Kepler described by himself, ætat. twenty-seven.

"A body of no ample proportions, lean and scraggy; a mind unambitious, that is to say, burying itself in literary nooks and crannies, suspicious, timid, tending towards, and abiding in difficulties and knotty points; manners to correspond. Sour and sharp flavours, the gnawing of a bone, the devouring of dry bread, form my gustatory delights; my keenest ambulatory joy is to traverse steep and rugged paths, to mount hills, to pierce my way across dense thorn-brakes. Pleasure in life other than in study I neither have nor desire; proffered, I reject. My fortune matches my tastes to a hair. Where others might abandon hope, I find access to achievement and fame. Yet not over spacious; for my advance is continually checked, and my circumstances change without mending. All my efforts have hitherto met with strenuous resistance. It may be that social sympathy will ever be denied me while I irritate mankind by advocating the movement of the earth, while

"tanti ponderis orbem
Obnixa cervice cito per sidera lapsu
Incito, terricolū contra nitente senatu."

A. M. CLERKE

UPLAND AND MEADOW

Upland and Meadow, a Poetquissings Chronicle. By Charles C. Abbott, M.D. (London: Sampson Low, Marston, Searle, and Rivington, 1886.)

THIS is a very pleasantly written book by an author who may be justly regarded as a kind of American Gilbert White. We may as well inform our readers at once that the district of which the natural history is herein chronicled is situated by a little stream which empties itself into the River Delaware, and that the name, which will appear to English readers somewhat difficult of pronunciation, is of Indian origin. There are fourteen chapters in the work, and an index which is to be strongly commended for its completeness. It is really a most important feature in a book of this kind to have a good index, and in insisting upon this necessity we are intentionally paying a complimentary tribute to the